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DO INTERVIEWERS' VOICE CHARACTERISTICS INFLUENCE COOPERATION RATES IN TELEPHONE SURVEYS?

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Although telephone interviewing is one of the major data collection methods used in survey research and response rates have been declining for years, the effects of the interviewers' voice characteristics on the cooperation of respondents have hardly been studied. The decision to participate in a telephone survey results from a complex of factors (Dillman, Gallegos, & Rencher, 1976; Groves & Couper, 1998; Groves & McGonnacle, 2001). Yet, the interviewers' voice characteristics may be particularly important, as visible aspects of communication are absent. Since our aim was to evaluate the impact of the interviewers' voice characteristics as such, we restricted our study to the first stage of the introduction, namely the interviewer reading the introductory text. The great majority of refusals to participate in a telephone interview occur immediately after this first stage (Dijkstra & Smit, 2002; Maynard & Schaeffer, 1997; Oksenberg & Cannell, 1988). Because no persuasion techniques are applied during this stage, such voice characteristics as pitch or speech rate may therefore affect the first reaction of the recipient.

The few studies that have been performed on this matter (Hüfken & Schäfer, 2003; three studies in Oksenberg & Cannell, 1988) concerned one or two of the following measures: (1) voice characteristics established by objective acoustic measures; (2) judges' ratings of voice characteristics; and (3) judges' ratings of the (supposed) recipients' impression of personal characteristics of the interviewer. Our research project was designed to extend these studies by (a) utilizing each of the three measures jointly; (b) applying the measures to interview introductions from a large-scale household survey, and (c) relating the measures to the interviewers' cooperation rates (being a specification of response rates, as explained later) actually obtained in that household survey as well as to the rated willingness of judges to grant an interview.

Thus, our research question is formulated as follows: Do the (perceived) interviewers' voice characteristics and personal characteristics relate to cooperation rates in telephone interviews, and if so, is there a plausible theoretical explanation for these relationships?

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PAST RESEARCH AND PRESENT HYPOTHESES

Empirical Studies

Generally stated, the relationship between voice characteristics of questioners and compliance by listeners has hardly been studied (see Barath & Cannell, 1976; Blair, 1978; Smith & Shaffer, 1991, 1995). Moreover, only four research articles have been published—as far as we know—specifically regarding the effects of the interviewers' voice characteristics on (non)response rates in survey studies. The most comprehensive study is provided by Oksenberg and Cannell (1988). They reanalyzed data of 10 female interviewers from earlier studies (Oksenberg, Coleman, & Cannell, 1986; Sharf & Lehman, 1984) and presented new analyses involving 12 and 25 female interviewers respectively. Their findings indicate that *acoustics* measures of the interviewers' voice characteristics were not associated with response rates. However, *judges' ratings* of the interviewers' voice characteristics appeared to be much more useful in predicting response rates. The overall findings indicate that interviewers with higher response rates were rated as having greater loudness, faster rates of speaking and—for some of the studies—higher pitched voices and greater overall intonation. In addition, Sharf and Lehman (1984) reported a strong correlation between response rate and a rated 'mean pause duration' (fluency of speaking). Hüfken and Schäfer (2003) found positive effects of loudness but negative effects of speech rate and intonation.

The logical expectation that judges' ratings of voice characteristics will correlate significantly with their equivalent acoustic measures was not always met. Oksenberg and Cannell (1988) reported relatively strong correlations for pitch, intonation, and speech rate, and a moderate correlation regarding 'number of pauses' (i.e. fluency of speaking).

Regarding the judges' ratings of personal characteristics the results indicated that interviewers with higher response rates were rated as more confident and more competent (Oksenberg & Cannell, 1988) and as more personal and enthusiastic (Hüfken & Schäfer, 2003).

The Relationship Between Voice Characteristics and Nonresponse

The fact that decisions to refuse or grant an interview often occur during or immediately after the interview introduction (e.g. Maynard & Schaeffer, 1997) suggests that peripheral routes of decision making are applied (Cacioppo & Petty, 1987). The decision to participate is based mainly on peripheral factors—as the interviewer's voice—that are linked to the message or the context in which it is presented, instead of elaborating on relevant information. Cialdini (1987, 1988) formulated six compliance principles (reciprocation, social validation, consistency, liking, authority, scarcity) that people use to decide whether or not to comply with a request if following peripheral routes. In our study—focusing on the first impression of just one verbal statement—the principles of *liking* and *authority* might possibly apply. These principles state that recipients are more willing to agree with people they like and people they consider an authority figure. Interviewers' voice characteristics that affect liking or the perception of authority would thus be expected to affect the decision to cooperate.

A linguistic approach of requesting people to participate in a telephone interview appears to correspond well to the compliance principles of liking and authority.

In linguistics it is suggested that the very act of asking questions, or making a request, defines the state of the questioner as dependent on or subordinate to the recipient. Furthermore, it is claimed that questions in languages all over the world are higher pitched (e.g. 'Don't you hear me?') than corresponding statements that rephrase the same words (e.g. 'You don't hear me'; Haan, 2001). In addition, the intonation of questions is characterized by the typical final rise in pitch as well as by an overall higher register level; all tones are raised relative to their values in a corresponding statement. Some linguists posit that the supposed dependent state of the questioner and the higher pitch levels in questions are part of a biological 'frequency code' that must be considered prelinguistic (Haan, 2001; Ohala, 1994). This code reflects a fundamental opposition between high and low pitch, in mammals as well as in birds, based on the fact that pitch is indicative of a vocalizer's size; high pitch denotes 'small,' and low pitch 'large.' A higher level of pitch would thus be associated with a lower level of dominance. Ohala (1994) states that in human speech, 'social' messages—such as politeness and submission—are also signaled by a high pitch. Applied to the introductory text of a telephone interview, it means that a higher pitched request expresses the submissive or non-authoritative position of the interviewer, and is in accordance with social rules and politeness, and thus more likeable. Consequently, a higher pitched request may simultaneously imply less authority, and thus less compliance, as well as more liking, and thus more compliance.

All in all these notions lead us to the hypothesis that aspects of likeability and authority may be intervening variables in the relationship between voice characteristics and nonresponse.

Hypotheses

In answering the research question, we employed two dependent variables, namely cooperation rate and judges' willingness. While cooperation rate reflects the proportion of all respondents interviewed of all eligible respondents contacted, the judges' willingness refers to the ratings of the judges to grant a hypothetical interview after listening to the interviewers' voice. Given the current state of research, all hypotheses were subjected to two-tailed tests. Since our study involved a small number of interviewers (31), the tests were performed at the 10-percent level. The following hypotheses were tested:

1. The acoustic characteristics of the interviewers' voice are associated with:
   a. the interviewers' cooperation rate;
   b. the expressed willingness of judges to grant an interview.
2. The judges' ratings of the interviewers' voice characteristics are associated with:
   a. the interviewers' cooperation rate;
   b. the expressed willingness of judges to grant an interview.
3. The acoustic characteristics of the interviewers' voice are associated with likeability and authority of the perceived interviewer's approach.
4. The judges' ratings of the interviewers' voice characteristics are associated with likeability and authority of the perceived interviewer's approach.

5. Likeability and authority of the perceived interviewer's approach are associated with:
   a. the interviewers' cooperation rate;
   b. the expressed willingness of judges to grant an interview.

METHODS

Data

The present study was based on 62 audio-taped introductory parts of telephone interviews performed by 31 interviewers. The interviews originate from a nationwide household survey (using a CATI procedure and RDD sampling) concerning commercials on radio and television and advertisements in magazines and newspapers, which was conducted jointly by the University of Amsterdam and the Vrije Universiteit Amsterdam (Pondman, 1998; Smit & Neijens, 2000). The interviewers, who received one day of training, constituted a homogeneous group of female students aged between 19 and 22 years, with little interviewing experience. Thus confounding of our independent variables with other variables like the interviewer's gender, age, experience, etc. is unlikely. A total of 2,740 recipients of 18 years or older were contacted, and the introductions recited to 2,155 of these persons were taped (Dijkstra & Smit, 1999). The introductory part of the telephone interview was prescribed, leaving no room for improvisation. It read as follows (translated from Dutch):

> Good evening, this is [interviewer's name] from the Vrije Universiteit Amsterdam. We're conducting a study into how people deal with commercials on television and radio, and advertisements in papers and magazines. The interview will take about 15 minutes. Can I ask you some questions?

For the present study, callbacks and introductions containing major deviations from the scripted text or interruptions by the recipient, were excluded. From the set of eligible 1,409 introductions, we randomly selected two introductions per interviewer: one that was immediately followed by a refusal and one that was immediately followed by a grant. The recordings lasted about twelve to nineteen seconds.

Operationalization and Procedures

Cooperation rate was defined according to the standard definition of the American Association for Public Opinion Research (2000) as the proportion of all cases interviewed of all eligible units ever contacted. We used the standard formula COOP4, defining those unable to do an interview as incapable of cooperating, thus excluding them from the base, and including partials as interviews. We applied an adjusted, more stringent form of this cooperation rate by including only those cooperating respondents who agreed to an interview immediately after they heard the introductory text (*immediate* cooperation rate). In this way, we excluded the effects of any persuasion attempts by the interviewer. The immediate cooperation rate ranged from .14 to .51. The eventual cooperation rate (i.e. including the effects of persuasion attempts) varied from .28 to .61 (or from .29 to .67 including callbacks), which is quite low, but normal in survey research in the Netherlands.

In addition to the cooperation rate, we asked judges to express their *willingness to comply* with a hypothetical interview, after hearing the introduction.

Regarding the acoustic measures as well as the judges' ratings of voice characteristics and the judges' ratings of personal characteristics, we used procedures and indicators similar to those of Oksenberg and Cannell (1988). To ascertain the acoustic measures we applied the 'Praat' linguistic program (see Boersma & Weenink, 2000), using a .01 seconds interval of measurement. The five acoustic measures were defined as follows:

1. *Pitch*: The mean fundamental frequency; the minimum and maximum pitch value accepted were 75 and 600 Hertz respectively.
2. *Intonation*: The variation in fundamental frequency.
3. *Speech rate*: The inverse mean duration of the text (all introduction texts were identical).
4. *Fluency*: The fraction of voiced intervals (the number of intervals with any detected pitch divided by the total number of intervals).
5. *Loudness*: The mean loudness.

Since the acoustic measures of loudness appeared to be hampered by recording problems, we excluded this acoustic variable from our study.

The five characteristics of the interviewers' voice were also rated by our judges. Moreover, judges rated 14 characteristics, partly obtained from Oksenberg and colleagues (1986), that might be related to 'likeability' and 'authority': enthusiastic, polite, friendly, pleasant, personal (intimate), social (humane), not aloof, professional, intelligent, reliable, self-assured, objective (impersonal), overriding (dominant), not indecisive.

In two rating sessions, 12 judges—junior staff members from our faculty, aged between 25 and 35—evaluated the different aspects of the interviewers' voices. In the first session they rated, in random order, the interviewers' voice characteristics (pitch, intonation, speech rate, fluency, and loudness) and subsequently their willingness to comply with the interviewer's request. We chose this order since we expected that rating the 'factual' voice characteristics first would have little consequences for the following task, while rating 'willingness' first might induce a prepossession. Although the items on vocal characteristics on the one hand, and the question of willingness on the other, do not refer to the same issue, question order effects might play some role. In a second session about a week later, the judges rated the personal characteristics attributed to the voices, again in random order.

All characteristics were rated by means of the magnitude estimation method, as in Oksenberg and Cannell's (1988) study. This procedure involves rating against a sample voice, which arbitrarily scores 10, on a scale from 0 to 20, on each characteristic. The rating tasks took place by means of a rating form on a website.

To evaluate the extent of agreement between raters, we computed intra-class correlations for each rated characteristic separately and for the aggregated voice characteristics, respectively personality characteristics. The intra-class correlations (ICCs) were derived from a two-way (interviewers and raters) mixed effect analysis of variance model (see McGraw & Wong, 1996). It appeared that removal of any of the raters did not affect the obtained coefficients. In general, voice characteristics were judged somewhat more reliably (with ICCs ranging from .56 to .85; ICC-total = .85) than were characteristics of personality (ICCs ranging from .44 to .79; ICC-total = .88). For hypothesis testing we aggregated the ratings at interviewer level by taking means over judges.

TABLE 1 **Pearson's correlations between the acoustic measures and judges' ratings of the interviewers' voice characteristics**

	Judges' ratings				
Acoustic measures	*Pitch*	*Intonation*	*Fluency*	*Speech rate*	*Loudness*
Pitch	**.84****	.54**	.29	.18	.27
Intonation	.61**	**.53****	.22	−.01	.46**
Fluency	.52*	.13	**.02**	.40*	.36**
Speech rate	.02	.20	−.15	**.77****	.11

$N = 31$, *$p < .10$, **$p < .05$ (two-tailed).

Three acoustic measures strongly correlated with the matching judges' ratings (see Table 1): That is pitch ($r = .84$); speech rate ($r = .77$), and intonation ($r = .53$). Fluency did not correlate at all with its rated counterpart; this characteristic is either poorly measured by the 'fraction of voiced time intervals', or very difficult to rate.

PERCEIVED PERSONAL CHARACTERISTICS: 'INTERVIEWER APPROACHES'

Factor analyses on the 14 judged personal characteristics of the interviewers—using Principal Component Analysis, the most robust procedure in cases with small numbers—revealed three factors (Table 2). The factors—with eigenvalues of 5.3, 5.1, and 1.4—accounted

TABLE 2 **Factor analysis of the fourteen personal characteristics of the perceived interviewer approach**

	Factor 1: Likeability	*Factor 2: Authority*	*Factor 3: Reliability*
Enthusiastic	**.91**	.20	−.10
Friendly	**.89**	−.09	.32
Social	**.85**	−.14	.25
Personal	**.84**	−.39	.11
Not aloof	**.83**	−.14	−.05
Polite	**.66**	−.15	.51
Not indecisive	−.10	**.89**	−.18
Overriding	−.09	**.87**	.31
Self-assured	−.08	**.86**	.21
Objective	−.31	**.83**	.31
Professional	.02	**.78**	.49
Reliable	.09	.28	**.91**
Intelligent	.03	.39	**.85**
Pleasant	.42	.11	**.82**
Cronbach's alpha	.92	.93	.92

$N = 31$.

for 83.9 percent of the variance. Orthogonal and oblique rotations resulted in similar solutions. In line with our theoretical notions, two factors can be interpreted rather straightforwardly as 'likeability' (enthusiastic, polite, friendly, personal, social, not aloof) and 'authority' (professional, self-assured, objective, overriding, not indecisive) respectively. The third factor encompasses three characteristics (reliable, pleasant, intelligent; explaining 10.3 percent of the variance) which we coined 'reliability'.

By grouping the respective characteristics together and averaging their scores, we established the concepts of likeability, authority, and reliability (Cronbach's alphas were .92, .93, and .92 respectively). While authority and likeability appeared to be unrelated, reliability correlated fairly strong with authority ($r = .48$, $p = .01$) and less strong with likeability ($r = .30$, $p = .10$).

RESULTS

The Interviewers' Voice Characteristics and Cooperation Rates

Hypothesis 1, about the effects of the acoustic voice characteristics on cooperation rate and willingness received no support at all; the ratings of the voice characteristics (Hypothesis 2), however, showed some stronger effects (Table 3). Rated fluency and rated loudness were positively associated with the interviewers' cooperation rate, and rated fluency and rated intonation correlated with the judges' willingness to cooperate. Pitch and speech rate, which emerged from the literature as salient voice characteristics, did not show any effects at all; regarding these characteristics, the variation between the interviewers was rather limited.

Hypotheses 3 and 4 stated that the interviewers' voice characteristics—established by acoustic measures and judges' ratings respectively—were related to the interviewer approaches likeability, authority, and reliability. The results (Table 3) by and large show that, in line with the hypotheses, three rated voice characteristics significantly relate to the interviewer approaches: pitch, intonation, and fluency.

Likeability appeared to be marked primarily by higher levels of pitch and intonation; in contrast authority and reliability were primarily indicated by a lower pitch. All three approaches were positively related to rated fluency (acoustic fluency showed deviating results). The correlations of pitch were nicely in line with the linguistic notions presented above: Pitch related positively to likeability, but negatively to authority and reliability.

The results on Hypothesis 5 showed that the perceived interviewer approaches indeed were associated with cooperation rate and willingness (Table 4). The likeable and reliable approaches were related primarily to willingness, while the authoritative approach primarily related to the immediate cooperation rate.

Willingness (of the judges) and cooperation rate are far from equivalent, however, and the two variables were uncorrelated ($r = .09$, $p = .34$). To understand this fact, we should take into account that 'cooperation rate' represents the decision of the survey respondents whether or not to take part in the interview, while 'willingness' merely represents a 'consent' without behavioral consequences and, moreover, was expressed by judges who were already involved in the study.

TABLE 3 **Pearson correlations between interviewers' voice characteristics and cooperation rate, willingness of judges to grant an interview, and interviewer approaches**

	Cooperation rate	*Willingness of judges*	*Interviewer approaches*		
			Likeability	*Authority*	*Reliability*
Acoustic measures of voice characteristics					
Pitch	.01	−.15	.42**	−.38**	−.43**
Intonation	.14	.12	.54***	−.18	−.05
Fluency	−.13	−.29	−.07	−.10	−.46***
Speech rate	−.11	.01	.23	−.26	−.10
Judges' ratings of voice characteristics					
Pitch	.09	−.13	.44**	−.26	−.34*
Intonation	.29	.35*	.86***	−.17	.03
Fluency	.43**	.36*	.43**	.32*	.34*
Speech rate	.08	.03	−.01	.16	−.04
Loudness	.39*	−.02	.20	.20	−.04

$N = 31$, *$p < .10$, **$p < .05$, ***$p < .01$ (two-tailed).

TABLE 4 **Pearson correlations between interviewer approaches and cooperation rate and the willingness of the judges**

Interviewer approach	*Cooperation rate*	*Willingness of judges*
Likeable	.25	.60**
Authoritative	.36*	.05
Reliable	.24	.76***

$N = 31$, *$p < .10$, **$p < .05$, ***$p < .01$ (two-tailed).

The correlations between voice characteristics at the one hand and cooperation rate and willingness at the other hand may be mediated by the perceived interviewer approach, since the impression that judges form about the interviewer is based on her voice characteristics. Although the outcomes of regression analyses indeed suggested such a mediation by the interviewer approaches, the number of research units in our study ($N = 31$) is too small to perform proper multivariate analyses.

CONCLUSIONS AND DISCUSSION

The purpose of this study was to investigate whether and how the interviewers' voice characteristics (pitch, intonation, fluency, loudness, speech rate) and personal characteristics ('interviewer approach') were related to cooperation rates in telephone interviews. The results showed that none of the *acoustic* measures of the interviewers' voice characteristics related significantly to the cooperation rate they had obtained in a household

study, nor to the willingness of judges to grant these interviewers an interview. These outcomes support the evaluation of Oksenberg and Cannell (1988) that acoustic measures are not very useful in predicting cooperation rates. However, parallel to findings of Oksenberg et al. (1986), this did not apply to the judges' ratings of the voice characteristics: the ratings of loudness, intonation (not significantly) and fluency showed positive associations with cooperation rate, as did intonation and fluency regarding willingness.

With respect to personal characteristics, in correspondence with compliance theory and linguistic notions, we could distinguish two dominant interviewer approaches—'likeability' and 'authority'—and a third less significant one—'reliability'. The correlations revealed that pitch and intonation (whether established acoustically or by the judges' ratings) had positive effects on 'likeability' and negative (sometimes non-significant) effects on 'authority' (and 'reliability'). This outcome nicely fits the conflicting features of 'making a request' that we predicted from the linguistic perspective, namely that a higher pitched request accords with social rules (i.e. is likeable) but also expresses submissiveness (i.e. is less authoritative). Our results suggest that the same may apply to intonation. Oksenberg and Cannell (1988, p. 265) suggested that 'perhaps there is a range of pitches and of variation in pitch that is equally acceptable' to clarify why, in their research, pitch and intonation were related to cooperation rate in only one out of three studies. From our theoretical point of view, the interpretation may be that, at a certain stage, the costs in terms of authority are higher than the benefits in terms of likeability.

The two dependent variables (cooperation rate and judges' willingness) appeared to be uncorrelated. Relating these two variables to the interviewer approaches showed an interesting difference. While cooperation rate was associated primarily with an authoritative approach, the judges' willingness appeared to be related primarily to likeability and reliability. The explanation of the differences between cooperation rate ('taking part in the interview') and 'willingness' ('consent only') simultaneously gives rise to a new hypothesis. The judges who performed the ratings had already complied with our request to participate in the experiment, and in addition they were asked to express their willingness to participate in a fictitious interview (without behavioral consequences). In terms of compliance, therefore, this latter situation seems to have much in common with the situation *during* an engaged interview, while 'immediate cooperation rate' clearly is linked to the introductory part of the interview. Following this line of reasoning, the results suggest that during the introduction of an interview an authoritative approach would be most effective, while during an engaged interview a likeable and reliable approach might be more appropriate to maintain cooperation.

In discussing the outcomes some restrictions of the present study need to be taken into account. First the limited sample size. Although we analyzed data of a CATI-project involving a national sample of more than 2000 respondents, the number of interviewers, who were the units of research in our study, was rather low: 31. Since most surveys involve a limited number of interviewers, methodological studies using survey data usually are hampered by this limitation (cf. Oksenberg & Cannell, 1988). A low number of cases limits the choice of techniques for statistical analysis, and explains why we used product moment correlations in the final analyses. It certainly is preferable to have a larger number of interviewers so that more powerful tools can be used: multiple regression analysis instead of correlations and structural equation modeling instead of

exploratory factor analysis. An additional suggestion is to use multilevel analysis techniques in order to take the nesting structure of the data (i.e. respondents are nested under interviewers) into account.

Second, the study was characterized by restrictions in terms of internal and external validity. The homogeneity of the interviewers (all female and under 30 years old) benefited the internal validity of our study, because we were interested in studying differences due to voice characteristics, not due to age and gender. At the same time, the homogeneity of the interviewers weakened the external validity, since in other CATI-projects interviewers may be over 30 or may be male. The balance between internal and external validity had thus shifted to internal validity more than to external validity. The validity issue also involved the judges, who were junior staff members (social scientists), not respondents. Again, the fact that they were experts benefited the internal validity but obviously harmed the external validity, and might provide an alternative explanation for the fact that the judges' willingness to grant an interview was not related to the interviewers cooperation rate. In a follow-up study we therefore suggest using actual respondents to judge voice characteristics.

The answer to our research question turns out to be a complicated one. It became clear that voice characteristics as perceived by judges do affect cooperation rates and that the same applies for the perceived interviewer approaches. Yet, due to the compound nature of the matter, consequences for the research practice are not clear-cut. Since—as found in earlier studies (e.g. Sharf & Lehman, 1984)—voice characteristics appeared to be interrelated (whether acoustically measured or rated by judges), they may be hard to use in the selection or training of candidate interviewers. The proverb 'The whole is more than the sum of its parts' probably applies strongly to the expressiveness of a voice. Moreover, it may be difficult to train interviewers to express voice characteristics in a specific manner in specific conditions. Given the apparent importance of the perception and interpretation of voice characteristics, an alternative method is to focus on the perceived interviewer approaches. Since there are probably many combinations of voice characteristics that can convey a similar interviewer approach (e.g. there are multiple ways to express authority), this method might be more fruitful. In that case, more research is needed into how interviewer approaches—as likeability, authority, and reliability—might be expressed and perceived during the introductory part of a telephone interview, and in which conditions they are effective in enhancing cooperation rates.

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